Drawings:

The attached sheets of drawings include 6 replacement sheets for Figs. 11A and 11B; 19A and 19B; 19C and 19D; 19E, 19F and 19G; 21A and 21B; and 21C, 21D and 21E.

In each replacement sheet, the Applicants have not amended the drawing but have attempted to provide improved image quality.

Attachment: Replacement Sheets.

Remarks/Arguments:

This Amendment adds no new claims, and is provided to submit replacement drawing figures, and amend the specification and claims 5 and 15. No new matter has been added. Upon entry of this Amendment, claims 1-20 will be pending. Claims 1, 7, 9, 10, 11, 17, 19 and 20 are independent.

Objections to the Drawings

The Examiner has objected to a number of drawings as lacking optimal quality. Accordingly, the Applicants have submitted replacement sheets as suggested by the Examiner, and respectfully request the withdrawal of the objection of the figures.

Objection to the Specification

The Examiner has objected to the title of the specification. Accordingly, the Applicants have amended the title of the specification as suggested by the Examiner, and respectfully request the withdrawal of the objection.

The Applicants have also amended the specification to correct a number of typographical errors.

Rejections of the Claims under 35 U.S.C. 102

The Examiner has rejected claims 1, 2, 6-12 and 16-20 under 35 U.S.C. 102(b) as being anticipated by the publication entitled "Extraction Of Photographic Area From Document Images" of Osamu Nakamura et al., (hereinafter Nakamura). Specifically, the Examiner points to Nakamura as disclosing a system and method for binarizing an image having an input part for receiving an image, a block classification part for dividing the received image into blocks and classifying the divided blocks into character blocks and background blocks, an edge enhancement part for enhancing edges of a character block using relations between neighboring pixels in the character block classified by the block classification part and generating a threshold for distinguishing character pixels and background pixels of the character block, and a binarization part for binarizing pixels of

character blocks output from the edge enhancement part into a first brightness value for character pixels and a second brightness value for background pixels by comparing the pixels of the character blocks with the threshold, and binarizing pixels of background blocks output from the block classification part into the second brightness value, purportedly anticipating the invention as claimed by the Applicants in claim 1, and a method thereof, purportedly anticipating the invention as claimed by the Applicants in claim 11.

The Nakamura reference describes a method for improved photographic area segmentation accuracy by using an extraction algorithm. The proposed extraction algorithm uses the characteristics of both edge elements and background gray levels. The method first extracts photographic areas using an extraction algorithm, and then blocks that are judged as being two-valued areas (described in greater detail below) are quantized and transformed into black and white using a notchless bi-level quantization.

For segmentation of the photographic area prior to the notchless bi-level quantization, the extraction algorithm notes that gray level changes are more frequent in textual parts (two-valued areas) than those of photographic areas (candidate areas) (see page 77, Part 2, first paragraph of the Nakamura reference). Accordingly, three steps are performed.

First, a derivative histogram is used to determine a value Ts to decide what are two-valued areas and what are candidate areas.

Second, for the two-valued areas only, a ratio Te is determined, and for the candidate areas only, a ratio Wg is determined and the two are compared for each candidate area block to determine if any candidate area blocks are to be converted to two-valued areas. However, the process can be reversed such that converted blocks can be returned to a candidate area again using ratios of each (see page 78, Equation (7)). Still further, candidate areas can be reclassified as two-valued areas using a positional relationship (see page 79, Part 5).

Third, for the candidate area only of the first and second steps, the adjacent eight blocks of each candidate area are combined and still further expanded by one block width on each side then divided into sub blocks, and they then repeat elements of the first and second steps. The final widened and integrated areas are considered the final potential candidate areas (see page 79, Part 4), and the final two-valued areas are quantized and transformed into

black and white pictures (see page 80, Part 3). Specifically, the Nakamura reference describes a system for the bi-level quantization of the two-valued areas (textual parts) as segmented by the above three steps, resulting in the images shown in Nakamura Fig. 9.

The Nakamura reference describes a system for the segmentation and bi-level quantization of photographic areas. The Examiner points to the Nakamura reference as disclosing a method and device for binarizing an image as recited by the Applicants in independent claims 1 and 11. In regard to the input part, the Examiner points to the input image of Nakamura Fig. 1, and in regard to the block classification part, the Examiner points to at least the first step of the Nakamura segmentation as described above. In regard to the edge enhancement part, the Examiner points to the discussion of Nakamura Part 4, and in regard to the binarization part, the Examiner points to bi-level quantization step of Nakamura Part 3.

However, at least in regard to the edge enhancement part as recited by the Applicants in independent claims 1 and 11, the Nakamura reference does not describe each element as recited by the Applicants. Specifically, the Examiner points to Nakamura Part 4.2 which describes the calculation of $t\sigma$, which is used in the second step described above to separate the two-valued areas and candidate areas (see page 78, Equation (2)). To determine $t\sigma$, the Nakamura reference describes the use of a number Q of edge elements to first determine a percentage of edge elements to the total number of pixels (see page 81, last paragraph), plotted and from which, a value $t\sigma$ is determined. In the calculation of $t\sigma$, edge pixels are considered in a ratio relation for purposes of designating two-valued areas and candidate areas (see Nakamura Fig. 13 and page 78, Equation (2)).

In contrast, the Applicants recite an edge enhancement part which enhances edges of the character blocks *previously classified* by the block classification part. That is, to avoid adverse effects when an image includes an irregularly lighted subject, the block classification is performed prior to edge enhancement (see page 3, lines 4-6, and Figs. 2-5). In doing so, edge enhancement is performed upon character blocks previously classified by the block classification part.

The Examiner points to at least the first step of the Nakamura segmentation as described above as disclosing the block classification part, and points to the discussion of Nakamura Part 4 as disclosing the edge enhancement part. In the first and second steps of the Nakamura reference, a derivative histogram is used to determine a value Ts to decide what are two-valued areas and what are candidate areas, and for the two-valued areas only, a ratio Te is determined, and for the candidate areas only, a ratio Wg is determined and the two are compared for each candidate area block to determine if any candidate area blocks are to be converted to two-valued areas. However, this separation of areas is not performed *prior to the steps* as discussed in Nakamura Part 4, but are performed together. That is, the edge factor discussion of Nakamura Part 4 results in the value tσ, which is used in the second step described above to separate the two-valued areas and candidate areas (see page 78, Equation (2)). Accordingly, the steps of Nakamura Part 4 are integral to the area separation and are not performed after area separation.

Accordingly, the Applicants assert that the Nakamura reference does not disclose an edge enhancement part for enhancing edges of a character block *classified previously* by the block classification part. That is, the Applicants assert that the Nakamura reference does not disclose a system and method wherein block classification is completed prior to the edge enhancement. The Nakamura reference describes a system and method wherein edge factors (of Part 4), are clearly used as a factor in segmentation, which does not describe segmentation followed by edge enhancement.

For these reasons, the Applicants assert that the Nakamura reference does not disclose or reasonably suggest each element as claimed by the Applicants in independent claims 1 and 11, and the Applicants respectfully request the withdrawal of the rejection under 35 U.S.C. 102(b).

Regarding independent claims 7 and 17, the Examiner points to Nakamura as disclosing a system and method for binarizing an image substantially as recited in claims 1 and 11, and further reciting a block growing part for growing the classified character blocks, and restoring a block containing a character pixel, classified as a background block, to a

character block, purportedly anticipating the invention as claimed by the Applicants in claim 7, and a method thereof, purportedly anticipating the invention as claimed by the Applicants in claim 17.

Further, regarding independent claims 9 and 19, the Examiner points to Nakamura as disclosing a system and method for binarizing an image substantially as recited in claims 1 and 11, and further reciting a block grouping part for grouping a character block classified by the block classification part with its neighboring blocks, thereby generating a grouped block, and a block splitting part for separating the character block from the grouped block output from the edge enhancement part, purportedly anticipating the invention as claimed by the Applicants in claim 9, and a method thereof, purportedly anticipating the invention as claimed by the Applicants in claim 19.

Still further, regarding independent claims 10 and 20, the Examiner points to Nakamura as disclosing a system and method for binarizing an image substantially as recited in claims 1 and 11, and further reciting a block growing part for growing the classified character block, and restoring a block containing a character pixel, classified as a background block, to a character block, a block grouping part for grouping a character block output from the block growing part with its neighboring blocks, thereby generating a grouped block, and a block splitting part for separating the character block from the grouped block output from the edge enhancement part, purportedly anticipating the invention as claimed by the Applicants in claim 10, and a method thereof, purportedly anticipating the invention as claimed by the Applicants in claim 20.

However, as noted above, at least in regard to the edge enhancement part, the Examiner points to Nakamura Part 4.2 which describes the calculation of $t\sigma$, which is used in the second step described above to separate the two-valued areas and candidate areas (see page 78, Equation (2)). In contrast, the Applicants recite an edge enhancement part which enhances edges of the character blocks *previously classified* by the block classification part. In doing so, edge enhancement is performed upon character blocks previously classified by the block classification part.

The Examiner points to at least the first step of the Nakamura segmentation as described above as disclosing the block classification part, and points to the discussion of Nakamura Part 4 as disclosing the edge enhancement part. In the first and second steps of the Nakamura reference, a derivative histogram is used to determine a value Ts to decide what are two-valued areas and what are candidate areas, and for the two-valued areas only, a ratio Te is determined, and for the candidate areas only, a ratio Wg is determined and the two are compared for each candidate area block to determine if any candidate area blocks are to be converted to two-valued areas. However, this separation of areas is not performed *prior to the steps* as discussed in Nakamura Part 4, but are performed together. That is, the edge factor discussion of Nakamura Part 4 results in the value tσ, which is used in the second step described above to separate the two-valued areas and candidate areas (see page 78, Equation (2)). Accordingly, the steps of Nakamura Part 4 are integral to the area separation and are not performed after area separation.

Accordingly, the Applicants assert that the Nakamura reference does not disclose an edge enhancement part for enhancing edges of a character block *classified previously* by the block classification part. That is, the Applicants assert that the Nakamura reference does not disclose a system and method wherein block classification is completed prior to the edge enhancement. The Nakamura reference describes a system and method wherein edge factors of Part 4 are clearly used as factors in segmentation, which does not describe segmentation followed by edge enhancement.

For these reasons, the Applicants assert that the Nakamura reference does not disclose or reasonably suggest each element as claimed by the Applicants in independent claims 7, 9, 10, 17, 19 and 20, and the Applicants respectfully request the withdrawal of the rejection under 35 U.S.C. 102(b).

Regarding dependent claims 2, 6, 12 and 16, the Examiner, in addition to the reasons stated above, further points to Nakamura as disclosing an edge enhancement part having a first threshold selection part for calculating a first threshold for classifying each pixel of the character block as a character pixel or a background pixel, a mean computation part for

classifying pixels of the character block into character pixels and background pixels on the basis of the first threshold, and calculating mean brightness values for character pixels and background pixels of the character block, a normalization part for normalizing pixels of the character block using the mean brightness value for character pixels and the mean brightness value for background pixels output from the mean computation part so that the character pixels have a value close to '1' while the background pixels have a value close to '0', a quadratic operation part for performing a quadratic operation on the normalized character block so as to enhance edges of the character block and reduce noise of the character block, and a second threshold selection part for calculating a second threshold for classifying pixels into character pixels and background pixels, by normalizing the first threshold, and outputting the second threshold as a threshold for the binarization part and method thereof, purportedly anticipating the invention as claimed by the Applicants in claims 6 and 16.

In addition, the Examiner points to Nakamura as also having a denormalization part for denormalizing the quadratic-processed character block and providing the denormalized character block to the binarization part and method thereof, purportedly anticipating the invention as claimed by the Applicants in claims 2 and 12.

However, as noted above, the Applicants assert that the Nakamura reference does not disclose an edge enhancement part for enhancing edges of a character block *classified previously* by the block classification part. That is, the Applicants assert that the Nakamura reference does not disclose a system and method wherein block classification is completed prior to the edge enhancement.

Further, for the reasons stated above, the Applicants assert that the Nakamura reference does not disclose or reasonably suggest each element as claimed by the Applicants in independent claims 1 and 11, from which claims 2, 6, 12 and 16 depend. Accordingly, the Applicants respectfully request the withdrawal of the rejection under 35 U.S.C. 102(b) of dependent claims 2, 6, 12 and 16 for the same reasons.

Regarding claims 8 and 18, the Examiner, in addition to the reasons stated above, further points to Nakamura as disclosing a block growing part having a dilation part for

growing a character block and changing a block containing a character pixel, classified as a background block, to a character block, and a closing part for eroding the dilated character block and deducting connected blocks, purportedly anticipating the invention as claimed by the Applicants in claim 8, and a method thereof, purportedly anticipating the invention as claimed by the Applicants in claim 18.

However, for the reasons stated above, the Applicants assert that the Nakamura reference does not disclose or reasonably suggest each element as claimed by the Applicants in independent claims 7 and 17, from which claims 8 and 18 depend. Accordingly, the Applicants respectfully request the withdrawal of the rejection under 35 U.S.C. 102(b) of dependent claims 8 and 18 for the same reasons.

Rejections of the Claims under 35 U.S.C. 103

The Examiner has rejected claims 3 and 13 under 35 U.S.C. 103(a) as being unpatentable over Nakamura, in view of the publication entitled "Adaptive, Quadratic Preprocessing Of Document Images For Binarization" of Shan Mo et al., (hereinafter Mo). Specifically, regarding claims 3 and 13, the Examiner points to Nakamura as disclosing the claimed invention with the exception of the quadratic filter of the edge enhancement portion. The Examiner points to Mo as disclosing such a quadratic filter, purportedly rendering obvious the invention as claimed by the Applicants in claims 3 and 13.

The Mo reference describes a system and method for an adaptive algorithm for preprocessing document images prior to binarization. The Mo reference recognizes that edge enhancement and noise reduction is desirable before binarization, and that normalization is desirable even before preprocessing. To do so, the Mo reference describes the use of a normalization step prior to the adaptive preprocessing algorithm (see page 995, Equation (7)). However, the Mo reference fails to describe the normalization and preprocessing algorithm arrangement as a block classification for the classification of both character and background blocks and from which, only character blocks are edge enhanced as recited by the Applicants.

Accordingly, as the Nakamura and Mo references do not disclose or reasonably suggest each element of Applicants claims 1 and 11, from which claims 3 and 13 depend, the

Applicants respectfully request the withdrawal of the rejection under 35 U.S.C. 103(a) of dependent claims 3 and 13.

The Examiner has rejected claims 4, 5, 14 and 15 under 35 U.S.C. 103(a) as being unpatentable over Nakamura, in view of the publication entitled "Fast Segmentation Of The JPEG Compressed Documents" of de Queiroz et al., (hereinafter de Queiroz). Specifically, regarding claims 4 and 14, the Examiner points to Nakamura as disclosing the claimed invention with the exception of a discrete cosine transformation block and the use of an energy calculation for region classification. The Examiner points to de Queiroz as disclosing such a discrete cosine transformation block and the use of an energy calculation for region classification, purportedly rendering obvious the invention as claimed by the Applicants in claims 4 and 14. Regarding claims 5 and 15, the Examiner points to de Queiroz as disclosing the block size and energy calculation, purportedly rendering obvious the invention as claimed by the Applicants in claims 5 and 15.

The de Queiroz reference describes a system and method for the segmentation of JPEG-compressed images without decompression. However, as with the Nakamura reference, the de Queiroz reference does not the Nakamura reference does not disclose an edge enhancement part for enhancing edges of a character block *classified previously* by the block classification part as recited by the Applicants.

Accordingly, as the Nakamura and de Queiroz references do not disclose or reasonably suggest each element of Applicants claims 1 and 11, from which claims 4, 5, 14 and 15 depend, the Applicants respectfully request the withdrawal of the rejection under 35 U.S.C. 103(a) of dependent claims 4, 5, 14 and 15.

Conclusion

In view of the above, it is believed that the application is in condition for allowance and notice to this effect is respectfully requested. Should the Examiner have any questions, the Examiner is invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

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